

## INTRODUCTION

### EUTROPHICATION OF ESTUARIES

North Carolina's varied and extensive estuaries are naturally nutrient-rich. They assimilate, recycle, and partially remove heavy loads of nutrients which enter from farms and towns in the watershed and from some industrial outfalls. High primary productivity of estuarine phytoplankton, benthic macrophytes, and salt marshes requires readily available nutrients; it is the basis of important North Carolina commercial seafood harvests. Excessive nutrient concentrations, however, may cause dense algal blooms, anoxic bottom waters, and fish kills, damaging both commercial and recreational interests (Ryther and Dunstan 1971; Kuenzler et al. 1982; Copeland et al. 1983; 1984).

Excessive algal growth resulting from high nutrient concentrations in tidal rivers and oligohaline estuaries is a serious environmental problem. Problems have occurred in the low salinity regions of the Chowan and Neuse Rivers (Stanley and Hobbie 1977; Kuenzler et al. 1982; Stanley 1983; Paerl 1987). When temperature and light conditions are satisfactory for rapid algal growth, nutrients become the major controlling factor. Estuarine nutrient levels, especially in the upper, oligohaline region, are strongly affected by loads received from the water-shed (Kuenzler et al. 1979). Nitrogen and phosphorus removal by soils and biota between the watershed sources and the estuary help to decrease these loading rates (Kuenzler 1989, 1990).

In the Pamlico and the Chowan River estuaries, either nitrogen (N) or phosphorus (P) may be limiting from time to time (Kuenzler et al. 1979, 1982; Sauer and Kuenzler 1981). Prior studies have recommended that loadings of both nutrients be reduced to improve water quality (Kuenzler et al. 1979, 1982; Paerl 1987). We need more information on sources, cycling, and ultimate fate of nutrients in our sounds and estuaries. Numerous scientific studies over the past 20 years in several of our estuaries have been summarized in Copeland et al. (1983; 1984) and Copeland et al. (1989), but the data base is still inadequate for many management purposes.

### NUTRIENT PROCESSING BY FORESTED WETLAND SYSTEMS

The streams and rivers originating in and crossing the Coastal Plain province are largely bordered by floodplain swamps and bottomlands generally termed riparian wetland forests. Studies of the functioning of North Carolina swamp stream and river bottomland systems (Kuenzler et al. 1977,